

# (12) UK Patent Application (19) GB (11) 2 329 493 (13) A

(43) Date of A Publication 24.03.1999

(21) Application No 9815885.0

(22) Date of Filing 22.07.1998

(30) Priority Data

(31) PO8177 (32) 22.07.1997 (33) AU

(71) Applicant(s)

**Arnold Joseph Cummins**  
4 National Terrace, 28 National Circuit,  
Forrest Act 2603, Australia

**Thamotharam Pillai Prabakaran**  
3 Bridges Place, Isaacs Act 2607, Australia

**Robert Peter Separovic**  
12 Want Place, Latham Act 2615, Australia

(72) Inventor(s)

**Arnold Joseph Cummins**  
**Thamotharam Pillai Prabakaran**  
**Robert Peter Separovic**

(51) INT CL<sup>6</sup>

G06F 17/60

(52) UK CL (Edition Q )

G4A AUXF

(56) Documents Cited

EP 0450825 A2 US 5390113 A US 5117356 A  
US 4933842 A

Dr Dobbs Journal, v21, n13, p35(6), Jan-Feb 1996 &  
IAC Computer Access No 01911610

(58) Field of Search

UK CL (Edition P ) G4A AUXF

INT CL<sup>6</sup> G06F 17/60

Online: COMPUTER, EDOC, INSPEC, WPI

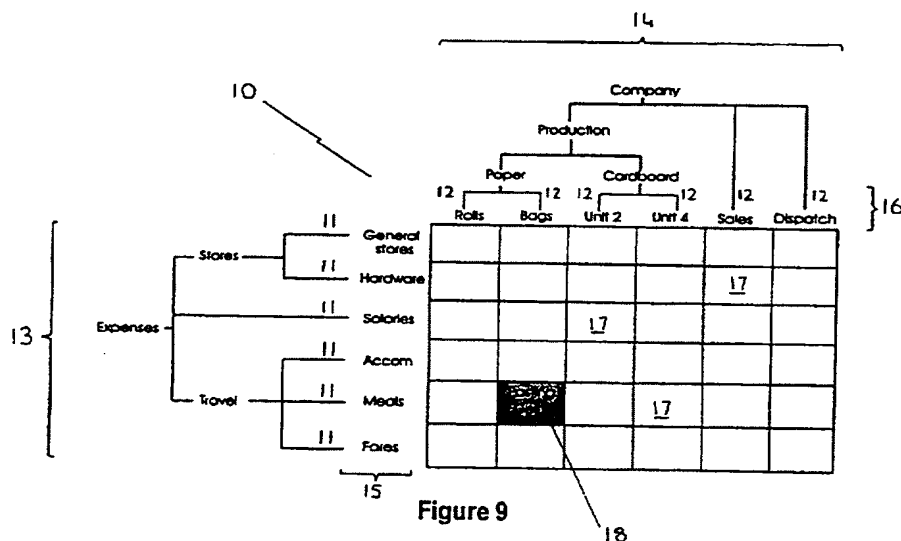
(74) Agent and/or Address for Service

**William Jones**  
Willow Lane House, Willow Lane, NORWICH, Norfolk,  
NR2 1EU, United Kingdom

(54) Abstract Title

**Accounting system and method**

(57) Disclosed is a computerised accounting system for summarising a plurality of transactions in a discrete system in accordance with their respective input and output effects. The system includes hierarchy means, matrix means and identification means. The hierarchy means establishes a multi-level hierarchy 13,14 for respective sets 15,16, of input and output effects. The matrix means establishes a multi-dimensional matrix 17, the dimensions of the matrix corresponding with the respective sets of input and output effects. Each element 18, of the matrix corresponds to a unique pairing of an input effect and an output effect. The identification means identifies each transaction by a transaction identification having a plurality of transaction identifiers.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

GB 2 329 493 A



Figure 1

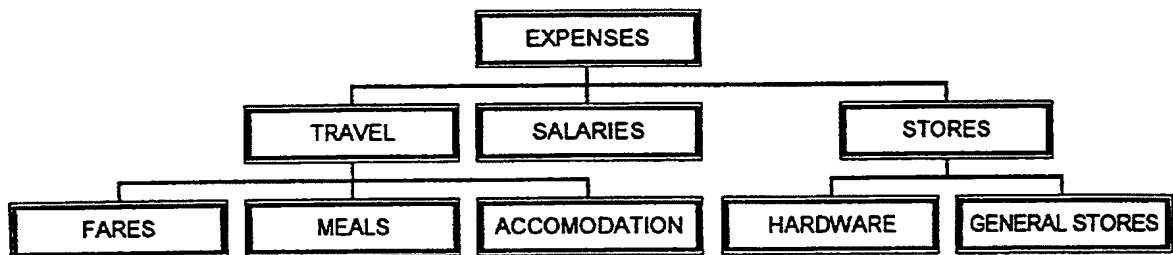


Figure 2

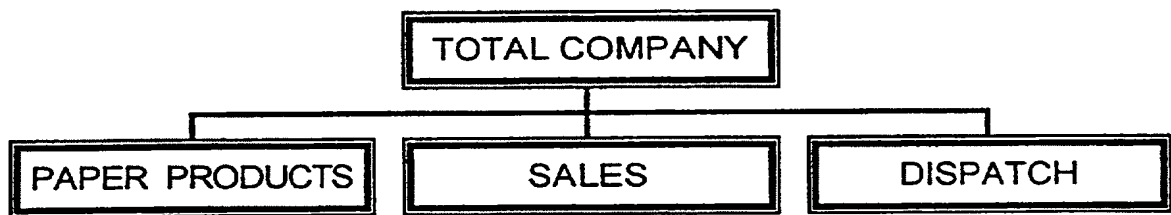


Figure 3

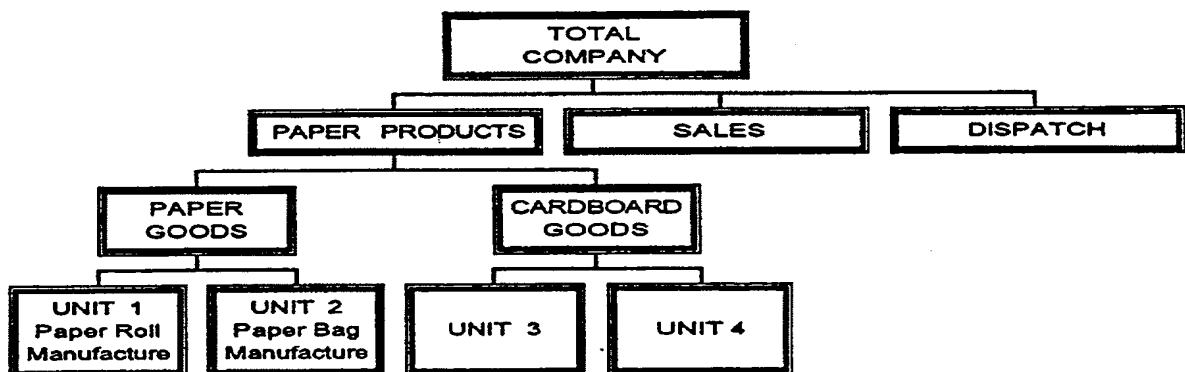


Figure 4

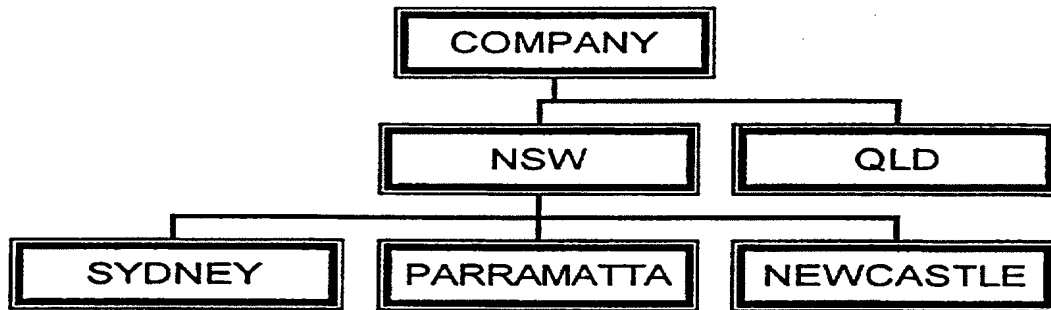


Figure 5

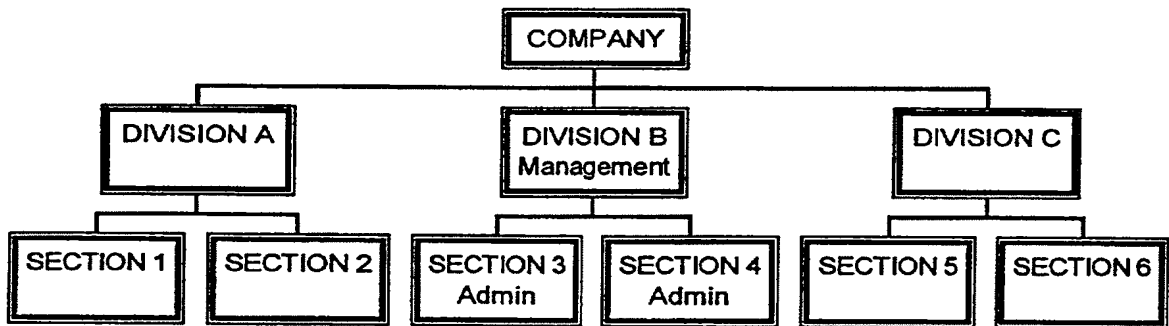


Figure 6

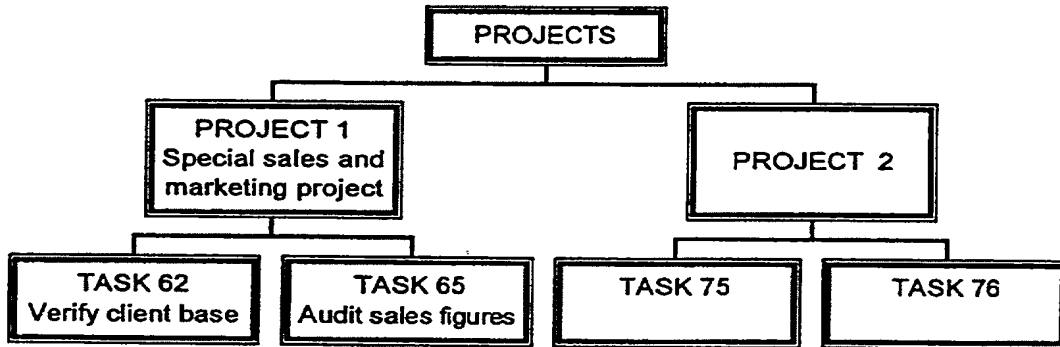


Figure 7

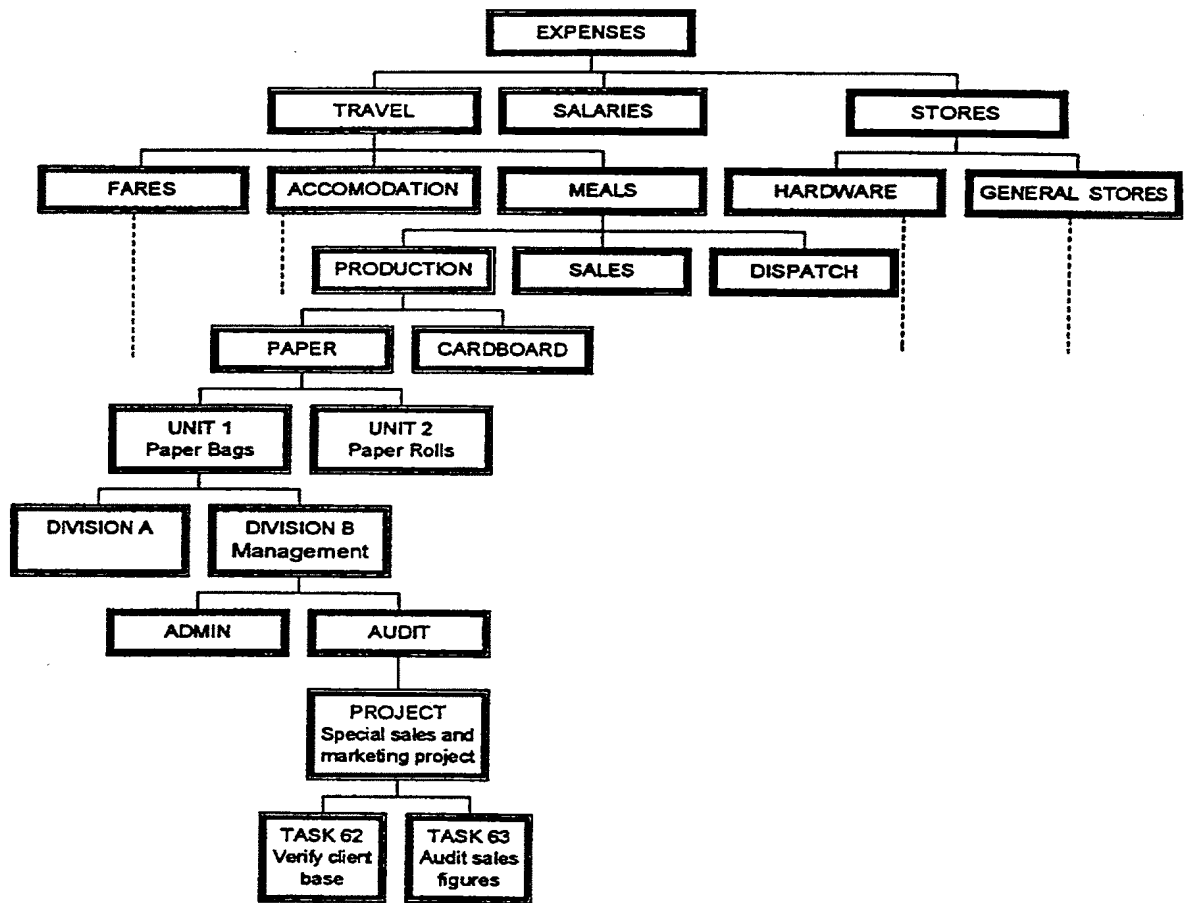
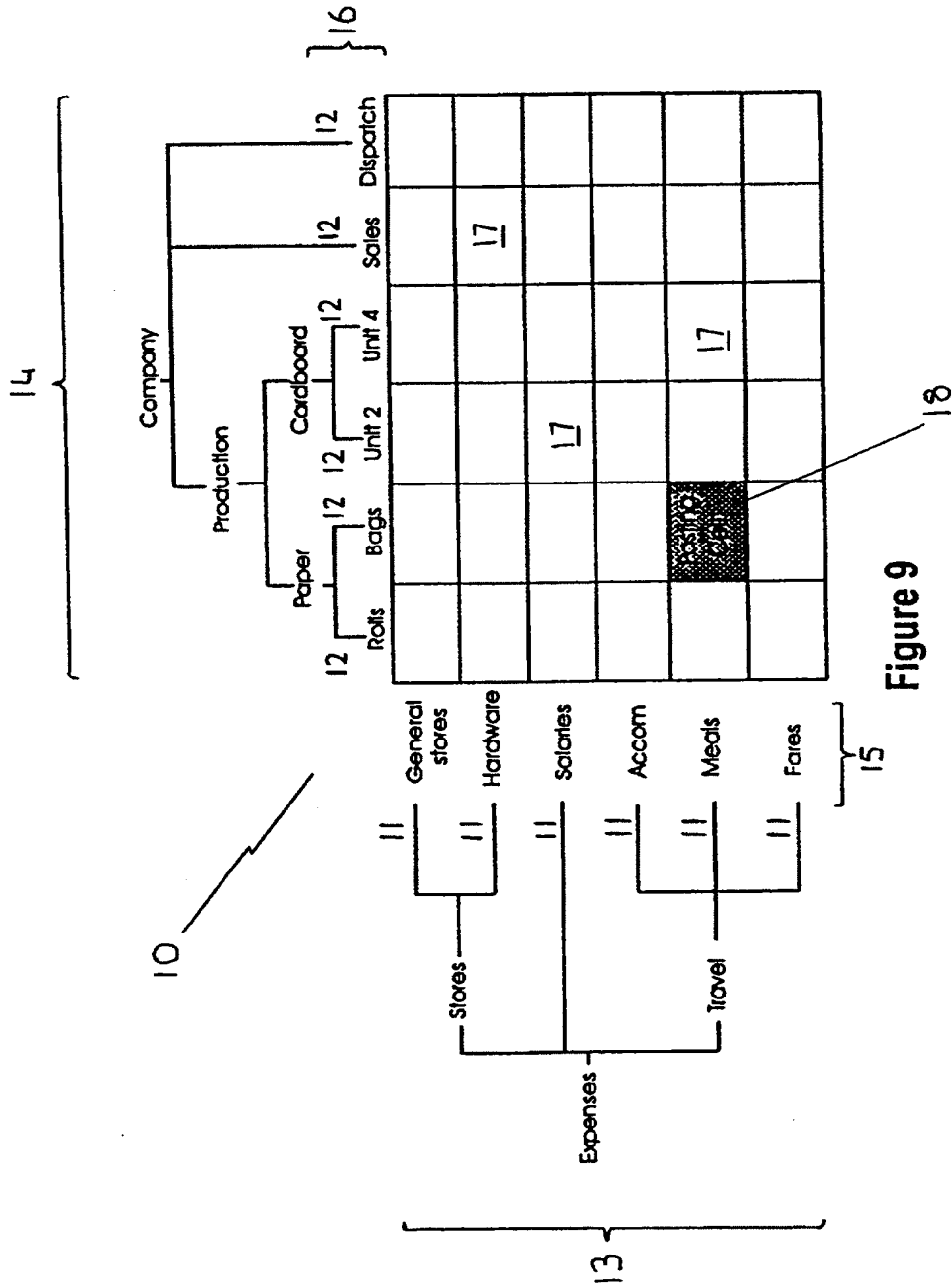


Figure 8



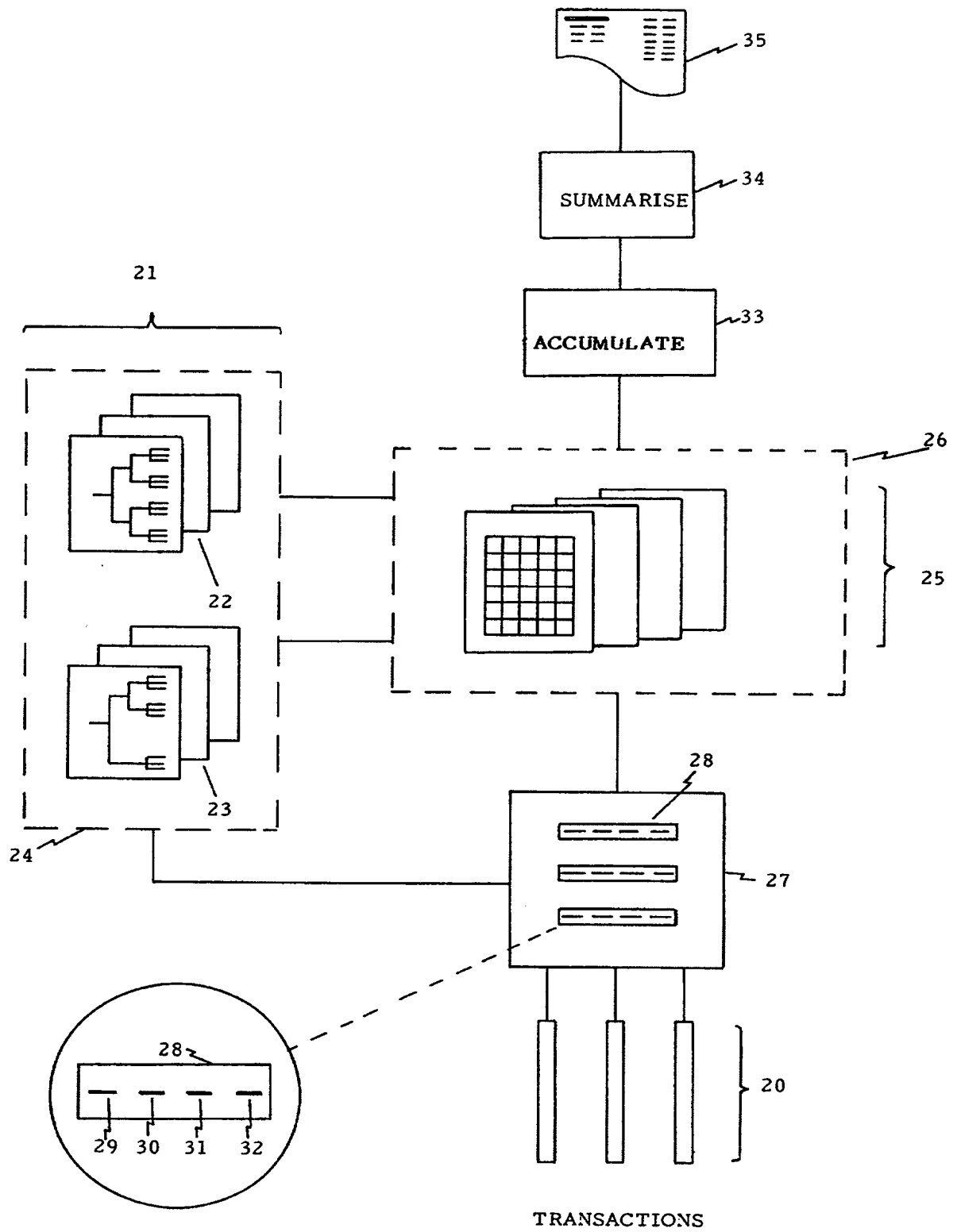


Figure 10

1

"ACCOUNTING SYSTEM AND METHOD"

Technical Field

5 This invention relates to an accounting system and method.

The invention has particular but not exclusive application to ledger based financial accounting systems and for illustrative purposes reference will be made to such an application. However it will be realised that  
10 the accounting system of the present invention is applicable to other accounting systems such as property management and stock and inventory control wherein numerical as opposed to financial analysis is required.

15 Background of Invention

Standard double-entry bookkeeping systems are well known in which items of income and expenditure are "posted" to credit and debit sides of respective accounts. Thus cheques drawn to pay for business  
20 expenses are posted as a credit to the cheque or bank account and as a corresponding debit to an appropriate one or more of a number of expense or operating accounts.

All organisations depend upon accurate financial information to know how much has been spent and received,  
25 for what purposes and from what sources. This knowledge enables statutory requirements to be satisfied - for example to produce annual statements of accounts for company law and taxation purposes, and to assist in management.

30 Small organisations may not need to analyse income and expenditure to great depth, and a simple series of accounts may suffice. Thus Travel, Salaries and Stores seen in FIG 1 provide a partial analysis of expenditure. Such accounts are called "Items of Expense".

35 In larger organisations much greater detail is needed as to the purposes for which expenditure is being made or moneys received. It is therefore insufficient to have a simple single-level General Ledger - instead,

information needs to be broken down repeatedly into more accurate sub-categories which permit detailed analysis of income and expenditure and the production of comprehensive reports incorporating this information. A mapping of the General Ledger accounts reflecting such items of information is called the "Chart of Accounts".

Thus as seen in FIG 2, the "Travel" Account in FIG 1 could be divided into "Fares", "Accommodation" and "Meals" and "Stores" might be divided into "Hardware" and "General Stores". The simple accounts table of FIG 1 has been expanded into the hierarchical structure of items and sub-items of FIG 2. This represents a simple accounts structure for the expenditure in an organisation with each box representing a category of expense, and each lower level box being a specific portion of a higher level category.

In practice, account structures have many more items and may well extend into far more levels of detail, creating a hierarchy of hundreds, even thousands, of different elements.

The items in the structure of FIG 2 are known as "inputs" of an organisation - that is, they are things on which money is expended in order to carry out the functions of an organisation.

Thus if a company for instance makes and sells paper products, it may expend money on staff salaries, on manufacturing materials, and on travel costs incurred by sales staff. Management needs to know how much is spent on these categories which can be regarded as "inputs" to the operational processes of the company.

Many conventional accounting systems concentrate on reporting expenses and receipts by input categories which typically are presented in annual accounts as is required by statute. General Ledger information often extends no further than this.

Other hierarchical structures of account presentation can be valuable for management purposes. These include output structures, location structures,



organisational structures and job or project structures.

Output structures include things which an organisation produces or achieves with the "inputs" described above. In Government organisations these are often referred to as "programs". Thus the paper products company considered above may have a number of outputs including production of paper products, sales of products and dispatch of goods as seen in FIG 3.

In turn these may be broken down further as seen in FIG 4, with "production of paper products" having subsets of paper goods and cardboard goods. Each product may in turn be further broken down into individual production units. The final "output" structure of FIG 4 consists of a hierarchy measurable in both unitary and monetary terms. It is desirable for management to have another General Ledger structure reflecting "outputs" rather than "inputs", because "outputs" are a measure of the operational effectiveness of the company.

Location structures as seen in FIG 5 are appropriate where organisations have offices, factories or depots in different locations.

Similarly organisational structures and job or project structures are representatively illustrated in FIGS 6 and 7.

It is known to use conventional ledger accounting methods to establish financial structures such as those outlined above. Known methods include the Extended Account Code and the Large Hierarchical Structure.

The Extended Account Code method utilises a simple code, such as a 2 or 3 digit numeric code, which is applied to each level in each hierarchy. This extended coding can then be used to represent the complete combination of all the hierarchical structures.

Some of the sample structures referred to previously could be represented in Extended Account Code as follows:

Input Structures

- . Give each Item a 2 or 3-digit numeric code. For example, the Item "Travel"

could be given the code "101"

- . Give each Sub-item a 2-digit numeric code.  
Thus "Meals" could be "07".

#### Outputs

- 5 . Give each major output group a numeric code in the range 01 to 99. For instance, "Production" could be "01".
- . Give each product a code in the range "01" through "99". For instance, "Paper Products" might have the code "02".
- 10 . Give each production unit a code in the range "01" to "99". Thus Unit 2, "Paper Bag Manufacturing" might have a code of "02".

#### 15 Organisation Structure

- . Give each Division a one-digit code in the range 1 through 9. Thus "Division A" might have a code of "3".
- . Give each Section a two-digit number in the range "01" through "99". "Section 2 - Audit Section" might have a code of "2".

#### Job/Project Codes

- . Give each project a code between, say, "0001" and "9999". Thus "Project 1 - Special Product Evaluation Project" may be coded as "9971".
- . Give each task a code in the range "01" through "99". "Task 1A - Assess Production Costs" may thus become costs "63".

30 Thus to record payment of a meal allowance to staff from the Audit Section within Division A who travelled to evaluate the production costs of the Paper Bag Manufacturing Unit, the coding used would be 101-07-01-02-04-3-2-9971-63. The greater the number of levels

35 within the structure, the longer the code becomes.

The Large Hierarchical Structure establishes a single hierarchical structure incorporating all levels in the different individual structures. Thus the relatively

simple example discussed previously could be represented by the abbreviated Large Hierarchical Structure illustrated in FIG 8.

## 5 Summary of Invention

The present invention aims to provide an alternative to known accounting systems and methods.

This invention in one aspect resides broadly in a method of accounting wherein a plurality of transactions  
10 in a discrete system are processed in accordance with their respective input and output effects, the method including:-

establishing a multi-level hierarchy for respective sets of the input and output effects;

15 establishing a multi-dimensional array or matrix wherein the dimensions of the matrix correspond with the respective sets of the input and output effects, each element in the matrix corresponding to a unique combination of input effects and output effects relevant  
20 to a transaction, and

identifying each transaction by a transaction identification having a plurality of transaction identifiers.

As used herein the expression "discrete system" is  
25 to be given a broad meaning and refers to a system, organisation, entity or the like in respect of which a set or sets of discrete accounting records can be kept. Examples of discrete systems include a business, a sporting club, a government department, a national or  
30 state economy etc:

As used herein the expression "transaction" is to be given a broad meaning and refers to events which are recorded and which add to and/or subtract from accumulated totals or summaries of events having  
35 characteristics in common. Examples of transactions include financial transactions such as cheques drawn and payments received, and numerical transactions such as control of floor space and associated costs in property

management, and in stock control where numbers of stock items produced, received or released.

As used herein the expression "input effect" is to be given a broad meaning and refers to those transaction generated effects which can be regarded as inputs to the discrete system on which the transaction has an effect. Examples of input effects include payments made and received, withdrawals from and replenishment of stock reserves etc.

As used herein the expression "output effects" is to be given a broad meaning and refers to those transaction generated effects which can be regarded as outputs from the discrete system on which the transaction has an effect. Examples of output effects include operational outputs such as products in a business, programs in a government department etc; locational outputs such as branches in a business, regional offices in a government program, centres in a state economy etc; organisational outputs such as divisions in a company and government department, departments within a government etc; and job or project outputs such as individual tasks and projects which may cut across organisations and locations.

As used herein the expression "multi-dimensional array or matrix" is to be given a broad meaning and refers to presentation or processing models in which information is correlated in accordance with a plurality of criteria. The expression is to be construed as including arrangements which are the equivalent of a given multi-dimensional matrix. Thus a number of sub-arrays or sub-matrixes of less than  $n$  dimensions can be the equivalent of an array or matrix of  $n$  dimensions.

As used herein the expression "sets of input and output effects" is to be given a broad meaning and refers to groupings of input and output effects which have characteristics in common. Examples of sets of input effects include expenditure, income etc. Examples of sets of output effects include operational outputs, locational outputs, organisational outputs and job or

project outputs as exemplified above.

In a preferred embodiment the method further includes accumulating totals of the individual transactions for each element in the matrix.

5 It is preferred that the transaction identification has a transaction identifier for only the lowermost level in each multi-level hierarchy. The identifiers may take various forms and preferably are numeric, alphabetic or alphanumeric codes.

10 It is also preferred that the method includes providing selected summaries of the accumulated totals to establish accounting records of selected input and output effects.

In another aspect this invention resides broadly in  
15 an accounting system for processing a plurality of transactions in a discrete system in accordance with their respective input and output effects, the system including:-

hierarchy forming means for establishing a multi-  
20 level hierarchy for respective sets of the input and output effects;

matrix forming means for establishing a multi-dimensional array or matrix wherein the dimensions of the matrix correspond with the respective sets of the input  
25 and output effects, each element in the matrix corresponding to a unique combination of input effects and output effects relevant to a transaction, and

input means for identifying each transaction by a transaction identification having a plurality of  
30 transaction identifiers.

The system preferably also includes accumulating means for accumulating totals of the individual transactions for each element in the matrix, and may further include summarising means for providing selected  
35 summaries of the accumulated totals to establish accounting records of selected input and output effects.

In a further aspect this invention resides broadly in a machine readable medium constituting programming

means for controlling a computer to process a plurality of transactions in a discrete system in accordance with their respective input and output effects, the programming means being operable:-

5       to establish a multi-level hierarchy for respective sets of the input and output effects;

          to establish a multi-dimensional array or matrix wherein the dimensions of the matrix correspond with the respective sets of the input and output effects, each  
10       element in the matrix corresponding to a unique combination of input effects and output effects relevant to a transaction, and

          to identify each transaction by a transaction identification having a plurality of transaction  
15       identifiers.

          Preferably the programming means are operable to accumulate totals of the individual transactions for each element in the matrix, and the programming means are operable to provide selected summaries of the accumulated  
20       totals to establish accounting records of selected input and output effects.

#### **Description of Drawings**

25       In order that this invention may be more easily understood and put into practical effect, reference will now be made to the accompanying drawings which illustrate a preferred embodiment of the invention, wherein:-

          FIGS 1 to 8 illustrate aspects of known systems;

30       FIG 9 illustrates a two-dimensional matrix by way of illustrative example of a multi-dimensional matrix utilised in the accounting system of the present invention, and

          FIG 10 is a schematic block diagram illustrating the  
35       accounting system and method of the present invention.

#### **Description of Preferred Embodiment of Invention**

          As can be seen in FIG 9, the accounting system of

the present invention utilises a multiple structure design which simplifies analysis and cross-analysis of financial information in a General Ledger.

5 In accordance with the present invention a General Ledger has a series of separate structures, each reflecting one of the different structural representations discussed above.

10 The structures are then brought together to form an array or matrix, where the bottom levels of each of the structures interact.

For simplification of diagrammatic presentation, FIG 9 illustrates a two dimensional matrix of two of the structures discussed above.

15 The identifiers at the bottom levels of the Input and Output structures form the two sides of the two-dimensional array or matrix used for illustrative purposes as exemplifying a multi-dimensional matrix. Where a combination of these identifiers interact a "posting cell" is created to which a particular  
20 transaction can be posted.

Codes can be numeric, alphabetic or alphanumeric. It is only necessary to enter a code against the bottom level identifiers, with both structures being coded. For example, to record a meal allowance claim for someone  
25 working in the Paper Bag Manufacturing Unit, the two codes or transaction identifiers "MEALS" and "BAGS" are sufficient to post the claim to the correct posting cell.

While the example given above is two-dimensional, many organisations will require more than two dimensions.  
30 Thus for the example given above in relation to the Extended Account Code, in the present invention the user enters four plain English codes or transaction identifiers "MEALS", "BAGS", "AUDIT" and "COSTS" which form the transaction identification "MEALS-BAGS-AUDIT-  
35 COSTS" which identifies the correct posting cell.

The system then accumulates the information up through the four different hierarchies.

With particular reference to FIG 9 which illustrates

a two dimensional array or matrix 10 whereby transactions can be processed in accordance with their respective input and output effects 11 and 12, the accounting method of the present invention is seen to establish multi-level hierarchies 13 and 14 for respective sets of the input and output effects 15 and 16. The method establishes a multi-dimensional array or matrix of which the two-dimensional array or matrix 10 is representative, with the dimensions of the matrix corresponding with the respective sets of the input and output effects 15 and 16. Each element 17 in the matrix corresponds to a unique combination of input effects and output effects relevant to a transaction, and constitutes a posting cell.

As is best seen in FIG 10, the accounting system of the present invention processes a plurality of transactions 20 in accordance with their respective input and output effects. Multi-level hierarchies 21 for respective sets of the input and output effects 22 and 23 are established by hierarchy forming means 24 and a multi-dimensional array or matrix 25 is established by matrix forming means 26. The dimensions of matrix 25, shown in FIG 10 for illustrative purposes as a series of two-dimensional matrixes, correspond with the respective sets of input and output effects 22 and 23.

Input means 27 identifies each transaction 20 by a transaction identification 28 having a plurality of transaction identifiers 29, 30, 31, 32 etc.

Accumulating means 33 accumulates totals of the individual transactions for each element in the matrix 25 and summarising means 34 selectively summarises the accumulated totals to establish accounting records 35 of selected input and output effects.

It will be readily appreciated by those skilled in the art that the present invention is well suited for performance on a suitably programmed or controlled computer. The multi-level hierarchies 21 can be entered by operators and stored in a data base constituting



hierarchy forming means 24. This provides file addresses for data storage means which effectively constitute the matrix forming means 26. Transaction identifications 28 are entered by keyboard which constitutes input means 27.

5 The dynamic database memory constitutes accumulating means 33 and summarising means 34.

It will also be appreciated that a software program can be developed by those skilled in the art and thus constitutes programming means operable to control a

10 computer to establish the multi-level hierarchies of respective sets of input and output effects, to establish the multi-dimensional array or matrix, to identify each the transaction, to accumulate the totals of individual transactions, and to provide the selected summaries.

15 The accounting system of the present invention is also useful for budgeting as the same multiple structures are utilised to enable users to develop budgets within the system, rather than simply entering figures which have been pre-calculated outside the system.

20 Budgets can be entered in either top-down or bottom-up. In the top-down budget a total budget figure is entered at the top of the combined structures and then spread down or across the different structures, skipping levels as required. In the bottom-up budget, figures are

25 entered at the posting cell level where the bottom-level accounts for the different structures intersect, and these are accumulated up through the levels as required by the user. The system, if required, matches budget figures against actual expenditures.

30 The accounting system of the present invention has a number of advantages over known systems.

The simplified system illustrated in FIGS 1 to 7 represents 5 different types of structure which may be used to present financial information. There could be

35 many other different financial structures which a particular organisation requires, and although it is unlikely that any one organisation would require more than four such structures, it is important that the

General Ledger can readily accommodate whatever requirement the organisation may have.

The Extended Account Code has a number of disadvantages, in that:

5 . it is difficult to understand, because the code is too complex to interpret quickly.

. it is extremely error-prone when recording data on the ledger, because the code is long and has no accuracy controls built into it. If any digits are accidentally  
10 transposed, it is almost impossible to identify the error.

. coding is very time-consuming.

The Large Hierarchical Structure system has a major disadvantage in that it becomes increasingly unwieldy as  
15 the number of levels in the hierarchy increases and the number of accounts within each level grows. If more than about 6 levels are required, the structure becomes too large and tends to be unmanageable.

Some organisations require a total of 12 or more  
20 levels of breakdown in their Chart of Accounts structure, and the Large Hierarchical Structure approach then becomes impossibly complex.

Large Hierarchical Structures can also be inflexible. If any part of the structure changes, it can  
25 be very difficult to change the Chart of Accounts.

On the other hand the accounting system and method in accordance with the present invention retains the best features and eliminates the worst features of the known conventional approaches to ledger design.

30 Coding is much simpler than under the "Extended Account Code" approach. For instance, the code "MEALS-BAGS-AUDIT-COSTS" is much easier to understand and assimilate than the Extended Account Code equivalent "101-07-01-02-04-3-2-9971-63".

35 In the same way, the Multi-tier hierarchy code is much more likely to be accurately coded than its Extended Account Code counterpart, so that the finished Ledger will contain more accurate information. In

particular, transposition errors are most unlikely.

If more meaningful alphabetic codes are used within the Multi-tier Hierarchy, as depicted in the example above, codings can be easily memorised by data preparers and can be readily understood even by casual readers who may not be at all familiar with the chart of accounts.

Although each tier has its own individual set of codes, so that a code from each tier must be selected to fully identify a posting cell, each individual tier is much easier to understand than a large and complex "Single Hierarchical Structure", and so is again far less liable to errors in coding or understanding. The combined tiers, because they are individually so much simpler, are also much easier to understand as a group.

It is possible to extract data (eg ledger balances) very efficiently from any combination of accounts taken from any or all of the multiple tiers. As a result, ledger information can readily be reported upon or enquired upon in real-time.

Ledger balances can be obtained in real-time at any level within the various ledger hierarchies, and not just at one or more pre-nominated levels.

It will of course be realised that whilst the above has been given by way of an illustrative example of this invention, all such and other modifications and variations hereto, as would be apparent to persons skilled in the art, are deemed to fall within the broad scope and ambit of this invention as is herein set forth.

**CLAIMS**

1. An accounting system for summarising a plurality of transactions in a discrete system in accordance with their respective input and output effects, said system including:

5 hierarchy means for establishing a multi-level hierarchy for respective sets of said input and output effects;

matrix means for establishing a multi-dimensional matrix wherein the dimensions of said matrix correspond with said respective sets of said input and output effects, each element in said matrix corresponding to a  
10 unique pairing of an input effect and an output effect; and

identification means for identifying each said transaction by a transaction identification having a plurality of transaction identifiers.

2. An accounting system as claimed in claim 1, the system including accumulating means for accumulating totals of said individual transactions  
15 for each element in said matrix.

3. An accounting system as claimed in claim 2, the system including summarising means for providing selected summaries of said accumulated totals to establish accounting records of selected input and output effects.

4. A machine readable medium for controlling a computer to summarise a  
20 plurality of transactions in a discrete system in accordance with their respective input and output effects, said programming means being operable:

to establish a multi-level hierarchy for respective sets of said input and output effects;

25

to establish a multi-dimensional matrix wherein the dimensions of said matrix correspond with said respective sets of said input and output effects, each element in said matrix corresponding to a unique pairing of an input effect and an output effect; and

5 to identify each said transaction by a transaction identification having a plurality of transaction identifiers.

5. A machine readable medium as claimed in claim 4, wherein said programming means are operable to accumulate totals of said individual transactions for each element in said matrix.

10 6. A machine readable medium as claimed in claim 5, wherein said programming means are operable to provide selected summaries of said accumulated totals to establish accounting records of selected input and output effects.

15 7. A method of accounting wherein a plurality of transactions in a discrete system are summarised in accordance with their respective input and output effects, said method including:

establishing a multi-level hierarchy for respective sets of said input and output effects;

20 establishing a multi-dimensional matrix wherein the dimensions of said matrix correspond with said respective sets of said input and output effects, each element in said matrix corresponding to a unique pairing of an input effect and an output effect; and

identifying each said transaction by a transaction identification having a plurality of transaction identifiers.

25

8. A method of accounting as claimed in claim 7, said method including accumulating totals of said individual transactions for each element in said matrix.
- 5 9. A method of accounting as claimed in claim 7 or claim 8, wherein said transaction identification has a transaction identifier for only the lowermost level in each said multi-level hierarchy.
- 10 10. A method of accounting as claimed in any one of claims 7 to 9, wherein said identifiers are numeric, alphabetic or alphanumeric codes.
- 11 11. A method of accounting as claimed in any one of claims 8 to 10, said method including providing selected summaries of said accumulated totals to establish accounting records of selected input and output effects.
12. An accounting system substantially as herein described with reference to and as shown in the accompanying drawings.
- 15 13. A machine readable medium substantially as herein described with reference to the accompany drawings.
14. A method of accounting substantially as herein described with reference to the accompanying drawings.

**Amendments to the claims have been filed as follows**

1. An apparatus for summarising a plurality of transactions in a discrete system in accordance with their respective input and output effects, said apparatus including:
  - 5 hierarchy means for establishing a multi-level hierarchy for respective sets of said input and output effects;
  - matrix means for establishing a multi-dimensional matrix wherein the dimensions of said matrix correspond with said respective sets of said input and output effects, each element in said matrix corresponding to a
    - 10 unique pairing of an input effect and an output effect; and
    - identification means for identifying each said transaction by a transaction identification having a plurality of transaction identifiers.
2. An apparatus as claimed in claim 1, the apparatus including accumulating means for accumulating totals of said individual transactions for each
  - 15 element in said matrix.
3. An apparatus as claimed in claim 2, the apparatus including summarising means for providing selected summaries of said accumulated totals to establish accounting records of selected input and output effects.
4. An accounting system for summarising a plurality of transactions in a
  - 20 discrete system in accordance with their respective input and output effects, said system including:
    - hierarchy means for establishing a multi-level hierarchy for respective sets of said input and output effects;
    - matrix means for establishing a multi-dimensional matrix wherein the
      - 25 dimensions of said matrix correspond with said respective sets of said

input and output effects, each element in said matrix corresponding to a unique pairing of an input effect and an output effect; and

identification means for identifying each said transaction by a transaction identification having a plurality of transaction identifiers.

- 5           5.    An accounting system as claimed in claim 4, the system including accumulating means for accumulating totals of said individual transactions for each element in said matrix.
6.    An accounting system as claimed in claim 5, the system including summarising means for providing selected summaries of said accumulated
- 10           totals to establish accounting records of selected input and output effects.
7.    A machine readable medium for controlling a computer to summarise a plurality of transactions in a discrete system in accordance with their respective input and output effects, said programming means being operable:
- 15           to establish a multi-level hierarchy for respective sets of said input and output effects;
- to establish a multi-dimensional matrix wherein the dimensions of said matrix correspond with said respective sets of said input and output effects, each element in said matrix corresponding to a unique pairing of
- 20           an input effect and an output effect; and
- to identify each said transaction by a transaction identification having a plurality of transaction identifiers.
8.    A machine readable medium as claimed in claim 7, wherein said programming means are operable to accumulate totals of said individual transactions for each element in said matrix.
- 25           9.    A machine readable medium as claimed in claim 8, wherein said



programming means are operable to provide selected summaries of said accumulated totals to establish accounting records of selected input and output effects.

- 5           10.    A method of accounting wherein a plurality of transactions in a discrete system are summarised in accordance with their respective input and output effects, said method including:

establishing a multi-level hierarchy for respective sets of said input and output effects;

establishing a multi-dimensional matrix wherein the dimensions of said matrix correspond with said respective sets of said input and output effects, each element in said matrix corresponding to a unique pairing of an input effect and an output effect; and

identifying each said transaction by a transaction identification having a plurality of transaction identifiers.
- 15           11.    A method of accounting as claimed in claim 10, said method including accumulating totals of said individual transactions for each element in said matrix.
- 20           12.    A method of accounting as claimed in claim 10 or claim 11, wherein said transaction identification has a transaction identifier for only the lowermost level in each said multi-level hierarchy.
13.    A method of accounting as claimed in any one of claims 10 to 12, wherein said identifiers are numeric, alphabetic or alphanumeric codes.
- 25           14.    A method of accounting as claimed in any one of claims 10 to 13, said method including providing selected summaries of said accumulated totals to establish accounting records of selected input and output effects.
15.    A computer in combination with a program which is loaded into the

computer such that, in use, the computer performs the steps of a method of summarising a plurality of transactions in a discrete system in accordance with their respective input and output effects, said method comprising the steps of:

5 establishing a multi-level hierarchy for respective sets of said input and output effects;

10 establishing a multi-dimensional matrix wherein the dimensions of said matrix correspond with said respective sets of said input and output effects, each element in said matrix corresponding to a unique pairing of an input effect and an output effect; and

identifying each said transaction by a transaction identification having a plurality of transaction identifiers.

15 16. A computer in combination with a program as claimed in claim 15, said method including accumulating totals of said individual transactions for each element in said matrix.

17. A computer in combination with a program as claimed in claim 15 or claim 16, wherein said transaction identification has a transaction identifier for only the lowermost level in each said multi-level hierarchy.

20 18. A computer in combination with a program as claimed in any one of claims 15 to 17, wherein said identifiers are numeric, alphabetic or alphanumeric codes.

25 19. A computer in combination with a program as claimed in any one of claims 15 to 18, said method including providing selected summaries of said accumulated totals to establish accounting records of selected input and output effects.

20. An apparatus substantially as herein described with reference to the accompanying drawings.

21. An accounting system substantially as herein described with reference to and as shown in the accompanying drawings.
22. A machine readable medium substantially as herein described with reference to the accompanying drawings.
- 5 23. A method of accounting substantially as herein described with reference to the accompanying drawings.
24. A computer in combination with a program substantially as herein described with reference to the accompanying drawings.



Application No: GB 9815885.0  
Claims searched: 1-6, 15-21, 24

Examiner: Geoffrey Western  
Date of search: 18 January 1999

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): G4A (AUXF)

Int Cl (Ed.6): G06F 17/60

Other: Online: COMPUTER, EDOC, INSPEC, WPI

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
A	EP 0450825 A2 (SAMPSON et al)	-
A	US 5390113 A (SAMPSON)	-
A	US 5117356 A (MARKS)	-
A	US 4933842 A (DURBIN et al)	-
A	Dr Dobbs Journal, v21, n13, p35(6), Jan-Feb 1996, Shusman D, "Programming with M", & IAC Computer Access No 01911610	-

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.